

Amendments to the Drawings:

The attached New Sheet of drawings includes new FIGs. 3 and 4.

Attachment: One New Sheet of Drawings

REMARKS/ARGUMENTS

The present application is the U.S. National Phase of International PCT Patent Application No. PCT/JP2004/015115 filed on October 14, 2004. Upon entering the U.S. National Phase on April 13, 2006, a First Preliminary Amendment and a Second Preliminary Amendment were filed in the U.S. Patent and Trademark Office. The First Preliminary Amendment canceled multiple dependent claims 3 and 6-8. The Second Preliminary Amendment amended claims 1, 2 and 5 and added new claims 9-18. No new matter was added. The First and Second Preliminary Amendments properly appear in the Patent Application Information Retrieval (PAIR) system of the U.S. Patent and Trademark Office.

It appears to Applicants that the First and Second Preliminary Amendments were not considered in the non-final Office Action issued on May 27, 2008.

Accordingly, before entry and consideration of the present Amendment, Applicants respectfully request the Examiner to enter and consider the First and Second Preliminary Amendments filed on April 13, 2006.

Turning to the present Amendment, claims 19 and 20 have been added. No new matter was added. Thus, claims 1, 2, 4, 5 and 9-20 are pending. Applicants submit arguments for overcoming the rejections based on the prior art of record and respectfully submit that the present application is in condition for allowance.

I. Claim Objections

In the non-final Office Action dated May 27, 2008, an objection is made with respect to claims 1, 2, 4, 5, 7 and 8 and appropriate correction is requested.

Claims 1 and 4 are objected to because “each element needs to be written out first before using abbreviation” (i.e. copper (Cu), nickel (Ni), etc.). Accordingly, the claims have been amended to include this format when referring to Ni, Cu, and the other chemical elements. Applicants respectfully request reconsideration and removal of the objection.

Claims 7 and 8 are objected to because the Examiner states that claim 7 is a multiple dependent claim and improperly depends from claim 6 which is a multiple dependent claim. Applicants respectfully request reconsideration. The multiple dependent claims, including claims 3, 6 and 7 were canceled from the present application via the First Preliminary Amendment filed on April 13, 2006 upon U.S. national phase entry. Accordingly, Applicants respectfully submit that this formality has already been corrected (see First and Second Preliminary Amendments).

Each of claims 2 and 5 is objected to as failing to further limit the subject matter of the base claim from which it depends. Claims 2 and 5 have been amended to include a structural limitation with respect to the copper existing as a solid solution in the alloy. No new matter was added. For example, see page 7, lines 1-2 and 10-12, of the present application, as filed. Accordingly, Applicants respectfully request reconsideration and removal of this objection.

II. Drawing Objections

In the non-final Office Action dated May 27, 2008, the drawings were objected to as failing to show the nickel alloy thin film, substrate layer or pad, Cu-Sn intermetallic compound layer, and solder bump recited in claims 4-16.

The present application has been amended to include a New Sheet of drawings containing new FIGs. 3 and 4. No new matter was added. See page 5, line 1, to page 6, line 2, of the present application, as filed.

The specification of the present application has also been amended to include a brief description of new FIGs. 3 and 4 and to include reference numerals in the description.

Applicants respectfully request reconsideration and removal of the drawing objection.

III. Claim Rejections – 35 USC §103(a)

In the non-final Office Action dated May 27, 2008, claims 1-8 are rejected under 35 USC §103(a) as being obvious over U.S. Patent Application Publication No. 2003/0193094 A1 of Takahashi et al. in view of JP 56-110230 of Ichikawa et al. and further in view of JP 2000-169957 of Obara et al.

The claims of the present application include claims 1, 2 and 17-20 directed to a sputtering target and claims 4, 5 and 9-16 directed to an assembly including a thin film between a solder bump and a substrate layer or pad. These claims are discussed separately below with respect to the above rejection.

Sputtering Target

Claims 1, 2 and 17-20 are directed to the structure of a sputtering target.

The primary reference in the above cited rejection is the Takahashi et al. publication. In the Office Action, it is stated that: “Takahashi discloses a nickel alloy sputtering target film 7”.

Applicants respectfully submit that this interpretation of Takahashi et al. is in error and that, for this reason, the rejection is improper and should be removed.

Takahashi et al. provide no disclosure with respect to a sputtering target or an operation in which a thin film is deposited by a sputtering operation. The Takahashi et al. publication describes using a Ni-P plating solution or a Ni-B plating solution to form a Ni layer (film 7) by an electroless plating process. For example, see Paragraph Nos. 0031 and 0056 of the Takahashi et al. publication. Thus, it is an error to interpret Takahashi et al. as disclosing a sputtering target or a thin film deposited by a sputtering operation. Takahashi et al. form a Ni film via electroless plating techniques, not sputtering techniques.

One of the problems addressed by the present invention is that it is extremely difficult to perform magnetron sputtering with a nickel sputtering target. (See page 5, lines 14-15, of the present application, as filed.) Also, see page 2, lines 4-8, of the present application which states:

“... Nevertheless, since nickel is a ferromagnetic material, it has inferior sputtering efficiency, and the nickel target must be made extremely thin in order to improve the sputtering efficiency. Thus, there is a problem in that the manufacture of this target is complicated, the target life is short, the target must be exchanged frequently, and, as a result, the manufacturing cost is increased.”

According to the present invention, 2 to 25at% of at least one element selected from among V, Cr, Al, Si, Ti, and Mo is added to a Ni-Cu alloy and a sputtering target is formed of this material. As best stated on page 5, lines 16-17, of the present application, as filed:

“As a result of adding the foregoing V, Cr, Al, Si, Ti or Mo, magnetron sputtering is enabled, and a significant effect is yielded in that the productivity is improved.”

Takahashi et al. do not utilize a sputtering operation or a sputtering target, and Takahashi et al.'s electroless plating process is not subject to the above referenced problems in connection with ferromagnetic materials. Accordingly, Takahashi et al. neither recognize the problem

solved by the present invention nor provide any teaching to one of ordinary skill in the art that would be material to overcoming this problem. Thus, the rejection of claims 1 and 2 as being obvious over Takahashi et al. in view of Ichikawa et al. and further in view of Obara et al. should be removed for at least this reason.

With respect to additional reasons for patentability, the secondary references fail to disclose a Ni-Cu alloy sputtering target including 2 to 25at% of at least one element selected from among V, Cr, Al, Si, and Mo. The Ichikawa et al. published Japanese application and its disadvantages are discussed on page 2, lines 9-10, of the present application, as filed. Its disclosure is limited to a Ni-Cu sputtering target including a relatively large amount, 24-39wt%, of Cu without any content of V, Cr, Al, Si, and Mo.

The Obara et al. published Japanese application is discussed on page 2, lines 18-19, of the present application, as filed. Its disclosure is limited to a Ni-V sputtering target in which the addition of V to the Ni material is for the purpose of improving the adhesion of a Ni thin film electrode to a ceramic substrate. The sputtering target has no Cu content.

In making the combination of the above cited prior art references, the Office Action states:

“it would have been obvious to one of ordinary skill in the art at the time the invention was made to specify the content and concentration of the nickel alloy of Takahashi with the Cu concentration’s range, as taught by Ichikawa, *for improving the attachment of the target to the substrate*, and further to include a specific range of concentration for V, as taught by Obara, *for further enhancing the attachment of the target to the substrate*.”

Applicants respectfully submit that an adequate rationale sufficient to support the legal conclusion of obviousness (as required according to the U.S. Supreme Court’s decision in *KSR Int’l v. Teleflex Inc.*) has not been provided with respect to why it would be obvious for one of ordinary skill in the art to modify the electroless plated film of Takahashi et al. with the Cu

concentration of the sputtering target of Ichikawa et al. and the V concentration of the sputtering target of the Obara et al. reference.

Following the U.S. Supreme Court's decision in *KSR Int'l v. Teleflex Inc.*, the U.S. Board of Patent Appeals has consistently held that rejections on obviousness grounds cannot be sustained by mere conclusory statements. Instead, there must be articulate reasoning with rational underpinning to support the legal conclusion of obviousness. The disclosures of prior art references must be taken as a whole, and it is improper to pick and choose various isolated teachings from unrelated references and combine them in hindsight using Applicant's own disclosure as a blueprint.

Here, Applicants respectfully submit that a proper *prima facie* case of obviousness cannot be made under 35 USC §103(a) following the teachings of Takahashi et al. in view of Ichikawa et al. and Obara et al. because an adequate rationale has not been, and cannot be, articulated for modifying the electroless plated film of Takahashi et al. with the sputtering targets disclosed by the Ichikawa et al. and Obara et al. references. The stated reasoning of ***"improving the attachment of the target to the substrate"*** is a mere conclusory statement. Attaching a "target" to a substrate has nothing to do with the present invention or the cited references. Whether the additional elements and concentrations will improve the attachment of an electroless plated film to a substrate is unclear from the record and may not even be factually accurate. One of ordinary skill in the art using common sense at the time of the invention would simply not have reasonably looked to the teaching of electroless plating in connection with producing a sputtering target.

As discussed above, Takahashi et al. fail to disclose anything with respect to sputtering targets. Thus, it would not be obvious for one of skill in the art to combine Takahashi et al. with

either of the Ichikawa et al. or the Obara et al. references. Further, Takahashi et al.'s film reacts with Sn containing solder to form a Ni-Cu-Sn intermetallic compound layer or a Ni-Pd-Sn intermetallic compound layer for purposes of inhibit the diffusion of Ni, not Sn. See Paragraph Nos. 0019 and 0058 of the Takahashi et al. publication.

With respect to the Ichikawa et al. publication, it fails to disclose a sputtering target including the addition of 2 to 25at% of at least one element selected from among V, Cr, Al, Si, Ti, and Mo. Thus, as discussed in the present application, the sputtering target of Ichikawa et al. will provide inferior sputtering efficiency, and a thin film deposited from the sputtering target will have a problem in that it will react with the substrate film and increase electrical resistance (see page 2, lines 11-13, of the present application, as filed.)

Finally, Obara et al. discloses a Ni-V target for forming an electrode, not a barrier layer. It includes no Cu. Accordingly, it would not be obvious for one of ordinary skill in the art to arrive at the present invention based on the isolated, unrelated teachings of a plated film of Takahashi et al., a Ni-Cu target of Ichikawa et al., and a Ni-V target/electrode of the Obara et al. reference.

Applicants respectfully request reconsideration and removal of the rejection of claims 1 and 2 for at least these reasons.

Previously presented claims 17 and 18 and new claims 19 and 20 include additional basis and reasons for patentability over the prior art of record. No new matter was added. See the present application on page 6, line 23, for a disclosure of a single phase metallographic structure; page 7, lines 13-14, for a disclosure of average crystal grain size; and page 7, lines 15-17, for a disclosure of purity.

Thin Film

Claims 4, 5 and 9-16 are directed to an assembly including a thin film between a solder bump and a substrate layer or pad. The Cu in the thin film of the present invention reacts with the Sn-containing solder to form a Cu-Sn intermetallic compound which yields the effect of inhibiting the diffusion of Sn. (See claims 9-16 and page 5, line 27, to page 6, line 5, of the present application.)

Applicants respectfully submit that an **adequate rationale** sufficient to support the legal conclusion of obviousness (as required according to the U.S. Supreme Court's decision in *KSR Int'l v. Teleflex Inc.*) has not been provided with respect to why it would be obvious for one of **ordinary** skill in the art to modify the electroless plated film of Takahashi et al. with the Cu concentration of Ichikawa et al. and the V concentration of the Obara et al. publication.

Following the U.S. Supreme Court's decision in *KSR Int'l v. Teleflex Inc.*, the U.S. Board of Patent Appeals has consistently held that rejections on obviousness grounds cannot be sustained by mere conclusory statements. Instead, there must be articulate reasoning with rational underpinning to support the legal conclusion of obviousness. The disclosures of prior art references must be taken as a whole, and it is improper to pick and choose various isolated teachings from unrelated references and combine them in hindsight using Applicant's own disclosure as a blueprint.

Here, Applicants respectfully submit that a proper *prima facie* case of obviousness cannot be made under 35 USC §103(a) following the teachings of Takahashi et al. in view of Ichikawa et al. and Obara et al. because an adequate rationale has not been, and cannot be, articulated for modifying the electroless plated film of Takahashi et al. with the sputtering targets/thin films disclosed by the Ichikawa et al. and Obara et al. references. The stated reasoning of ***"improving***

the attachment of the target to the substrate” is a mere conclusory statement. Attaching a “target” to a substrate has nothing to do with the present invention or the cited references. Whether the additional elements and concentrations disclosed by Ichikawa et al. and Obara et al. will improve the attachment of an electroless plated film to a substrate is unclear from the record and may not even be factually accurate. One of ordinary skill in the art using common sense at the time of the invention would simply not have reasonably looked to the teaching of electroless plating in connection with depositing thin films from sputtering targets.

As discussed above, Takahashi et al. fail to disclose anything with respect to sputtering targets or thin films formed by sputtering targets. Takahashi et al. also disclose the formation of a Ni-Cu-Sn intermetallic compound layer or a Ni-Pd-Sn intermetallic compound layer through the reaction with a Sn-containing solder layer, and this compound layer provides a function of inhibiting the diffusion of Ni, not Sn. See Paragraph Nos. 0019 and 0058 of the Takahashi et al. publication.

With respect to the Ichikawa et al. publication, it fails to disclose a sputtering target or thin film including the addition of 2 to 25at% of at least one element of selected from among V, Cr, Al, Si, Ti, and Mo. Thus, as discussed in the present application, the sputtering target of Ichikawa et al. will provide inferior sputtering efficiency, and a thin film deposited from the sputtering target will have a problem in that it will react with the substrate film and increase electrical resistance (see page 2, lines 11-13, of the present application, as filed.)

Finally, Obara et al. discloses a Ni-V target for forming a thin film electrode, not a barrier layer. It includes no Cu. Accordingly, it would not be obvious for one of ordinary skill in the art to arrive at the present invention based on the isolated, unrelated teachings of a electroless plated film of Takahashi et al. for inhibiting diffusion of Ni, a Ni-Cu target/thin film of Ichikawa et al.,

and an Ni-V electrode of the Obara et al. reference. It is not correct to assume that changing the concentration levels or adding additional elements to the electroless plating process will improve anything with respect to the plated film of the Takahashi et al. publication.

For these reasons, Applicants respectfully request reconsideration and removal of the rejection of claims 4, 5 and 9-16.

Additional reasons for the patentability of dependent claims 10, 11 and 13-16 also exist. These claims specifically require a Cu-Sn intermetallic compound layer that inhibits Sn diffusion. As stated above, Takahashi et al.'s disclosure is limited to the formation of a Ni-Cu-Sn intermetallic compound layer or a Ni-Pd-Sn intermetallic compound layer, and this compound layer provides a function of inhibiting the diffusion of Ni, not Sn. See Paragraph Nos. 0019 and 0058 of the Takahashi et al. publication.

IV. Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

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